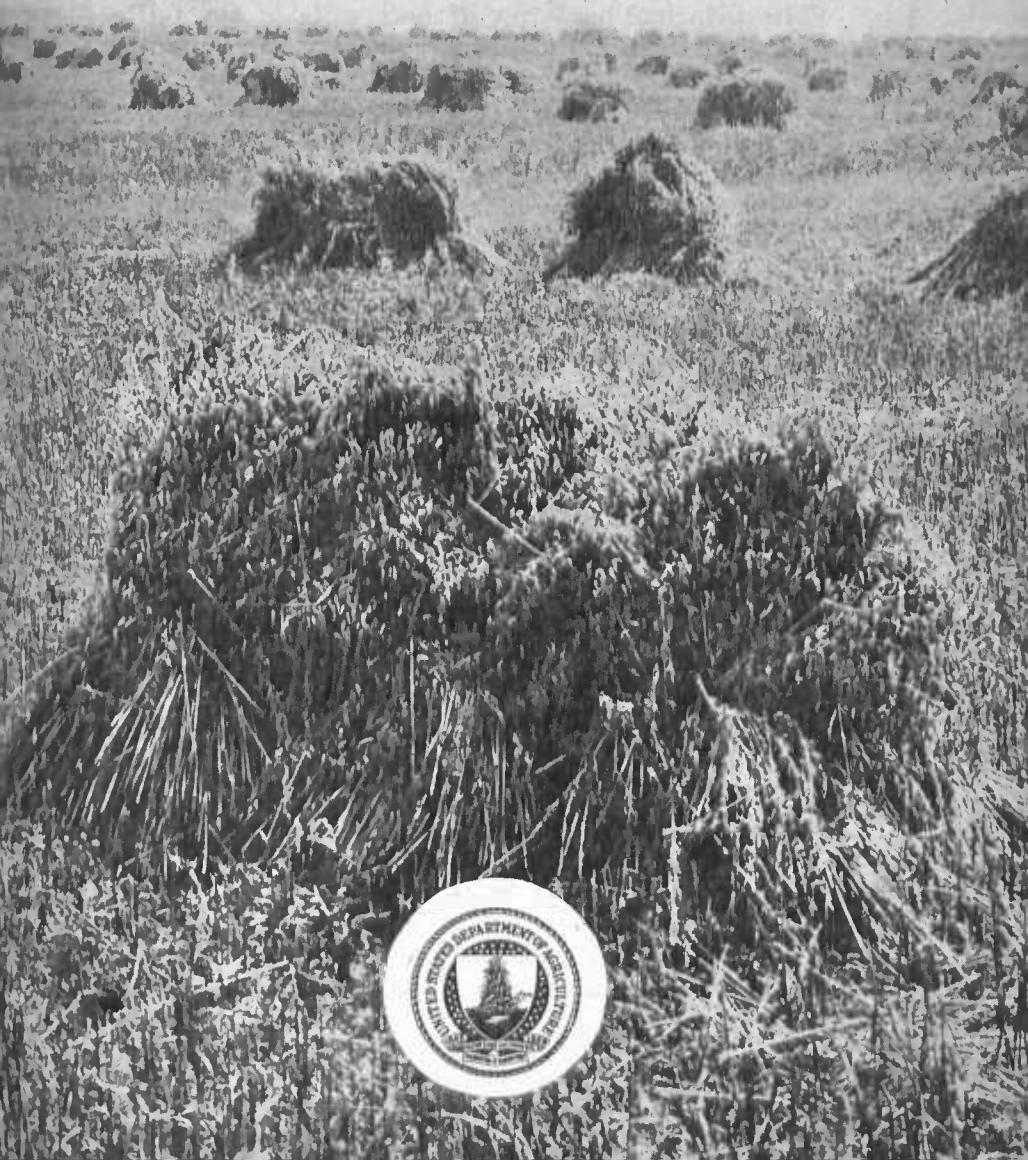


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Farmers' Bulletin 1119
United States Department of Agriculture

FALL-SOWN OATS



FALL-SOWN grain crops in the South provide a winter cover for the land, thus preventing washing and leaching. They also provide winter pasture and grain and forage for work stock and may be grown to advantage in rotation with corn and cotton. The oat crop is one of the best for fall sowing where it withstands the winter.

The principal varieties of oats suitable for fall sowing are the Red Rustproof, Fulghum, and Winter Turf. The Red Rustproof and Fulghum should be grown in the Gulf States, Georgia, and the Carolinas, and the Winter Turf in Virginia, Tennessee, and Kentucky.

Fall oats should be sown on well-prepared land with a grain drill at the rate of 2 to 3 bushels to the acre. The date of seeding varies from September 15 to November 15, according to the locality. Only clean, plump seed should be sown.

Fall oats may be harvested with the binder or the mower. A large part of the crop is cut for hay or is fed in the bundle without thrashing. Bundle oats and oat hay make excellent summer feed for work stock. Oats may also be used for pasture or as a soiling crop.

Contribution from the Bureau of Plant Industry

WM. A. TAYLOR, Chief

Washington, D. C.

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FALL-SOWN OATS.

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THE FALL-OAT AREA.

THE United States devotes more than 42,000,000 acres to oats each year, of which more than nine-tenths is spring sown. No regular annual reports on the acreage of fall-sown oats are made by the Bureau of Crop Estimates of the United States Department of Agriculture. However, this bureau made special reports on the acreage of fall-sown oats for the years 1916, 1917, and 1918, the figures reported being 3,054,000, 3,278,000, and 2,372,000 acres, respectively. The acreage harvested, as compared with the acreage sown, was reported for 1917 only; of the 3,278,000 acres sown 2,424,000 were harvested. The difference between the seeded and harvested acreages normally is not so great, as the percentage of winterkilling during the winter of 1916-17 was unusually high.

These special reports show that in the fall-oat area, embracing the States from Maryland, West Virginia, Kentucky, Arkansas, and Oklahoma southward, about 45 per cent of the oats grown are fall sown. The States in which more than 60 per cent of the acreage is sown in the fall are North Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana.

Fall oats are much less hardy than fall wheat and rye and can be grown only where the winters are comparatively mild. No definite limits can be drawn marking the sections where fall-sown oats succeed. The variety, the method of preparation, the time and manner of seeding, the kind of land on which the crop is grown,

and the climatic conditions of the particular section must all be taken into account. Oats sown early in drills or furrows on well-prepared land often survive the winter in the same locality where those sown under less favorable conditions winterkill. Fall-sown oats may be successfully grown in a particular section for several years; a season may then come when the crop will be entirely destroyed by cold or other unfavorable conditions. This was the case in the winter of 1916-17, when February freezes killed oats in localities where they were supposed to be practically a certain crop.

The accompanying map (fig. 1) shows approximately the sections in which oats can be sown in the fall with a reasonable degree of success.

The crop is recommended for South Carolina, Georgia, Alabama, Florida, Mississippi, and Louisiana; for Virginia and North Carolina, except in the Piedmont and mountain sections; and for southern and eastern Texas. In favorable years it can be grown in central and northern Texas, Arkansas (except the Ozark region), Tennessee, parts of Kentucky, at the lower elevations in western North Carolina and Virginia, and in southern Maryland. In these sections the yield is usually much better than that obtained from spring-sown oats; hence it is advisable to sow at least a part of the oat acreage in the fall and run the risk of loss from winterkilling. Fall-sown oats are also grown to a limited extent in western Washington and western Oregon. In California it is the practice to sow oats in the late fall or early winter. The conditions in these States are so different from those in the South, however, that discussion of them is not included in this bulletin.

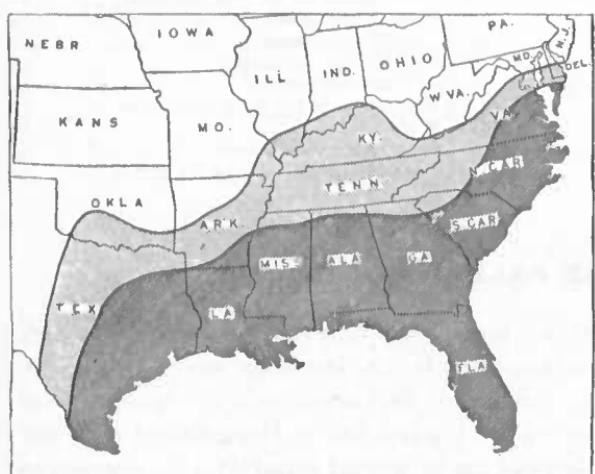


FIG. 1.—Map of the southeastern portion of the United States, showing the area in which oats may be sown in the fall. The heavily shaded portion shows the section where they are a comparatively sure crop; the section where they may be grown in favorable years is shown by lighter shading.

tions in western North Carolina and Virginia, and in southern Maryland. In these sections the yield is usually much better than that obtained from spring-sown oats; hence it is advisable to sow at least a part of the oat acreage in the fall and run the risk of loss from winterkilling. Fall-sown oats are also grown to a limited extent in western Washington and western Oregon. In California it is the practice to sow oats in the late fall or early winter. The conditions in these States are so different from those in the South, however, that discussion of them is not included in this bulletin.

ADVANTAGES OF FALL OVER SPRING SEEDING.

Farm conditions in the South can be improved by the use of a greater variety of crops and of definite systems of crop rotation and by the keeping of a greater number of live stock. A rational crop

rotation in the South is one which occupies the land practically the entire year, protecting the soil from washing during the winter by the use of a growing crop, such as crimson clover, vetch, or grain. Increasing the number of live stock requires the production of more grain for feeding. Fall-sown grains combine the two essential features, grain production and soil cover, in one crop. To some extent they also supply a third desirable feature, winter pasturage.

The advantages of fall seeding of oats over spring seeding wherever the fall-sown varieties can be grown are numerous. The yields are usually better, the fall-sown oats mature earlier, the land can usually be prepared in better shape in the fall than in the spring, fall seeding interferes less with other work than does spring seeding, poorer land and less fertilizer can be used for the fall-sown crop, and the fall-sown crop furnishes a cover for the soil during the winter and prevents washing.

Fall oats almost invariably yield more than spring oats, owing to their earlier maturity, stronger growth, and greater freedom from disease. If a part of the stand is lost from winterkilling, the plants which are left stool vigorously, so that the stand at harvest is often much better than was apparent in early spring. Fall-sown oats usually grow more vigorously and mature from 10 days to 2 weeks earlier than those sown in the spring. This earlier maturity often marks the difference between success and failure, as the later maturing grain is more likely to be injured by storms or drought and by rust and other plant diseases. Oats require comparatively cool weather for their best growth, so that those which mature earliest usually yield best, as the conditions are better suited to their development. The early maturity incident to fall seeding also allows the crop to be removed from the land earlier than spring seeding, giving more time for the preparation of the soil, seeding, and the growth of the following crop.

In order to obtain a satisfactory crop of spring oats it is necessary in the extreme South to sow the grain in January or early in February, and in February or early March farther north. At this time the ground is usually wet and cold and is not in condition to make a good seed bed. Clay soils may be materially injured by working them when wet, and only very sandy ones can be handled satisfactorily in this condition. On the other hand, at the time when the grain should be sown in the fall the ground is ordinarily in good condition to work, and a good, mellow seed bed can be prepared. This better preparation starts the young plants into vigorous growth and they go into winter in good shape. Seed sown in the winter or early spring on poorly prepared land is handicapped by this poor preparation, grows slowly, and is never as vigorous as that sown in a good seed bed.

When weather and soil conditions are right for preparing land in the spring, teams and men are needed to get the land ready for the more important crops, corn and cotton; consequently the preparation of the land for sowing oats is hurried or neglected. Fall seeding comes at a time when the teams are not needed for other work and there is more time to do the work properly. It allows a better division of the farm work, so that more time can be given to preparing the land in the spring for other crops. If the fall-sown crop of oats fails, little additional work is necessary to put the land in shape for reseeding in the spring.

As the plants have a longer time to draw the plant food from the soil and as they naturally grow more vigorously, fall-sown oats can be grown on poorer ground and with less fertilizer than those sown in the spring. Good soil and proper fertilization have much to do with the success of the oat crop in the South, however, regardless of the time of seeding.

One of the greatest losses on southern farms is from the washing of the soil during the winter. This can best be prevented by growing a fall-sown crop. Oats make a close, dense cover, which is very effective in holding the surface soil to prevent washing.

The foregoing are some of the reasons why it is desirable to sow oats in the fall in the South wherever there is a reasonable chance that they will withstand the winter. Proper methods of soil preparation and of seeding and the use of plump, heavy seed of hardy, productive varieties will largely increase the production of this grain. The methods described in this bulletin are in use by the agricultural experiment stations and by good farmers.

VARIETIES OF FALL-SOWN OATS.

The varieties of fall-sown oats commonly grown in the South are of two types, the Red Rustproof and the Winter Turf. The Red Rustproof type includes the common Red Rustproof under several similar names and selections and strains of that variety under entirely different names. Only one variety of the Winter Turf type is commonly grown, though many names are applied to it.

Red Rustproof is the typical variety of the group to which that name is here applied. Among the other names used for the same variety are Red, Texas Red, Red Texas, and Texas Red Rustproof. The leaves of the young plant in the fall are medium green in color and rather broad. The plant, while spreading, is less so than most other fall-sown grains. Seedling plants of the Red Rustproof oat are shown in figure 2. The straw of this variety is of medium height, straight and stiff. The heads are not large, but numerous. The grains are large and plump, yellowish or reddish brown in

color, and usually all awned. The Red Rustproof is early in maturing and is quite free from rust. Varieties similar to the Red Rustproof, most of which are special strains of that variety which differ very slightly from it, are the Appler, Bancroft, Cook, Hundred-Bushel, McGehee, and Patterson.

The Fulghum oat has recently come into prominence in some sections, particularly where the Red Rustproof had been practically the only variety grown for decades. It was first grown extensively in southeastern Georgia, where it is believed to have originated. This new variety soon became widely distributed in adjoining States, and it is now second to the Red Rustproof in importance among fall-

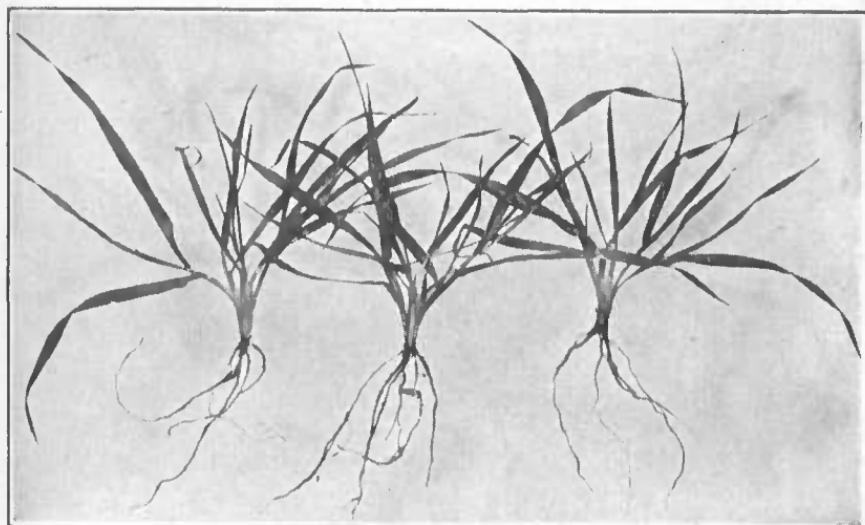


FIG. 2.—Seedling plants of the Red Rustproof oat. Note the partially erect habit as compared with the spreading habit of the hardier Winter Turf oat shown in figure 4.

sown oats. It matures about 10 days earlier than the Red Rustproof and the grain is usually lighter in color. In the field the Fulghum can be readily distinguished from the Red Rustproof by its more erect heads or panicles. The kernels of the Fulghum also are smaller and are nearly free from the awns and basal hairs characteristic of that variety; consequently its bushel weight is usually higher. As it yields nearly or quite as well, its earliness gives it a distinct advantage. Panicles (heads) of the Red Rustproof and Fulghum varieties are shown in figure 3.

Commercial lots of Red Rustproof oats often contain some medium-sized white kernels, producing strong plants and large heads which mature at about the same time as those from the red grains. The Culberson variety, as it is commonly grown, appears to be a selection of this white-kernelled type, though occasionally oats sold under this name can not be distinguished from the common Red

Rustproof. In some localities the Culberson oat yields as much grain as the Red Rustproof, produces more straw, and is a better variety to grow for hay or soiling. It is not at all commonly grown, however.

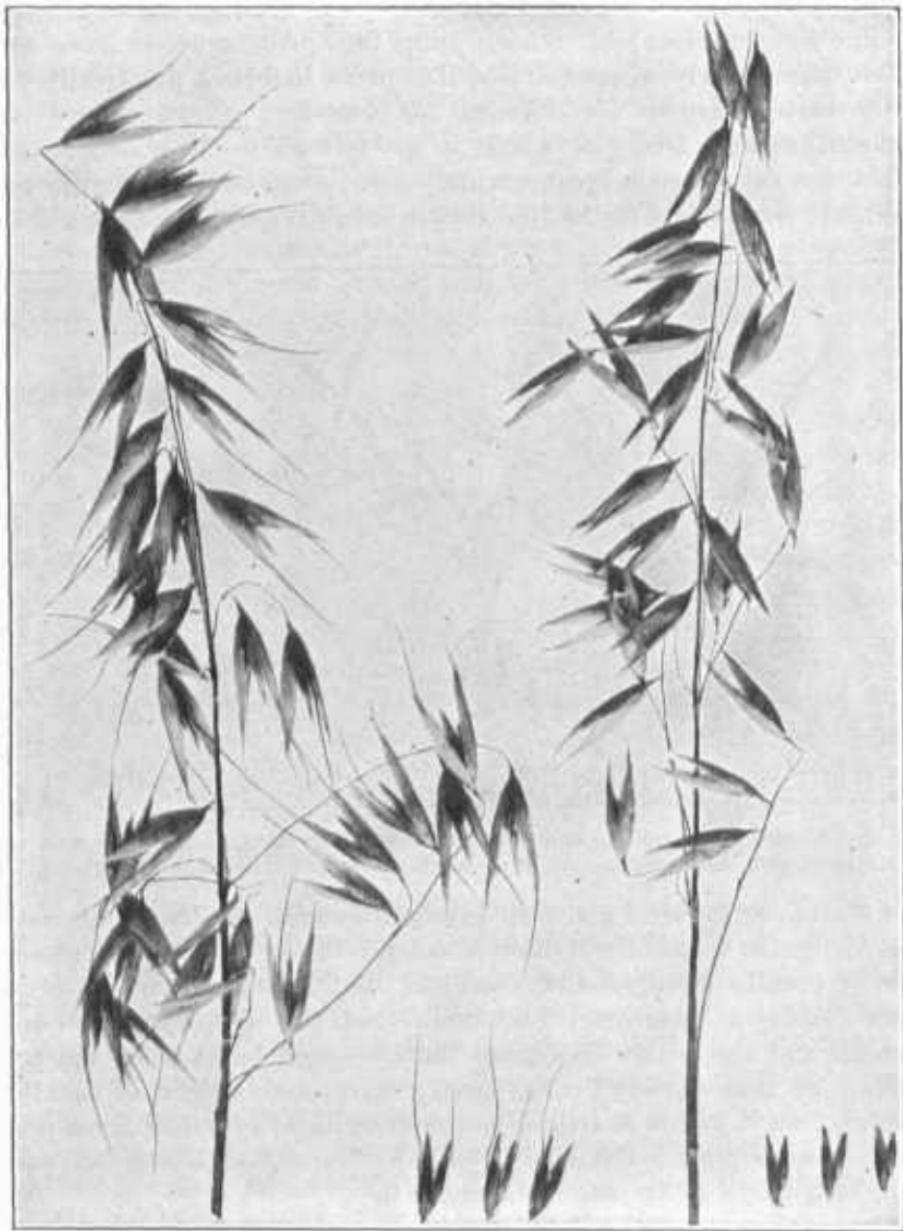


FIG. 3.—Heads of the two leading varieties of winter oats: Left, Red Rustproof; right, Fulghum.

The Winter Turf oat, which is also called Virginia Gray, Virginia Winter, Grazing, and several similar names, is better adapted to pasture and hay than to grain production. The leaves are narrow,

dark green in color, and numerous; the plant is more spreading in the fall than that of the Red Rustproof variety. This is well shown by a comparison of figures 2 and 4. The straw is tall and slender and the heads large and loose. The grain is of medium size, usually light gray in color, with distinct darker lines running from the base to the tip. The Winter Turf oat is either bearded or beardless; the beards, when they do occur, break off readily in thrashing. This variety is not resistant to rust or lodging. The numerous names applied to it may sometimes denote distinct strains, which, however, differ but little from the type. Heads of the Winter Turf and Culberson varieties are shown in figure 5.

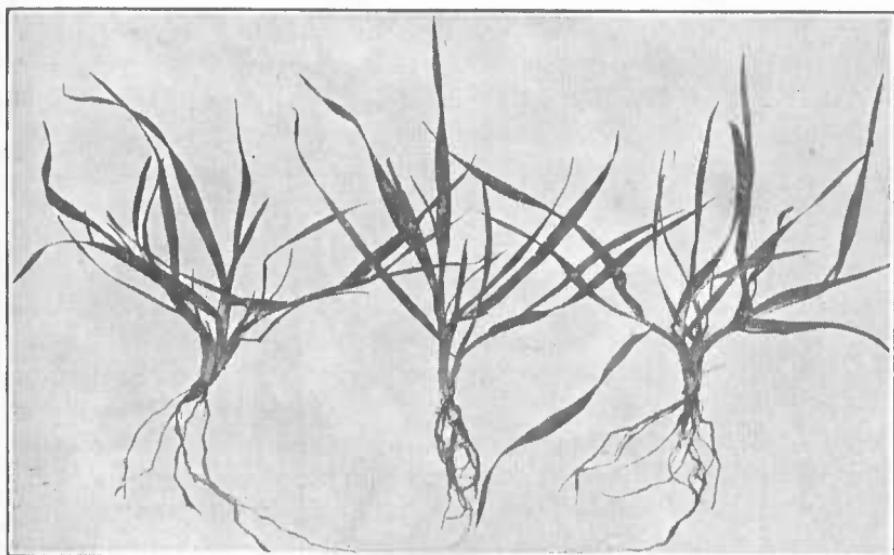


FIG. 4.—Seedling plants of the Winter Turf oat. Note the spreading habit of growth, which denotes winter hardiness.

The varieties of the Red Rustproof type are best adapted to the production of grain in all except the coldest portions of the fall-oat belt, where Winter Turf is to be preferred on account of its greater hardiness. In the sections where the Red Rustproof is sufficiently hardy, the Winter Turf is rather too late in maturing and is often injured by hot weather, producing low yields of poor quality. For pasture and hay production the Winter Turf is better than the Fulghum, Red Rustproof, or Culberson. Toward the northern limits of fall-oat production only the Winter Turf should be grown.

SOILS AND FERTILIZERS.

SOILS ADAPTED TO OAT PRODUCTION.

The soil for oats should be reasonably fertile and should hold moisture well, as this crop requires a large quantity of water and may be

severely injured by drought. Any soil which will grow a good crop of cotton or corn will produce oats, though the best results will be

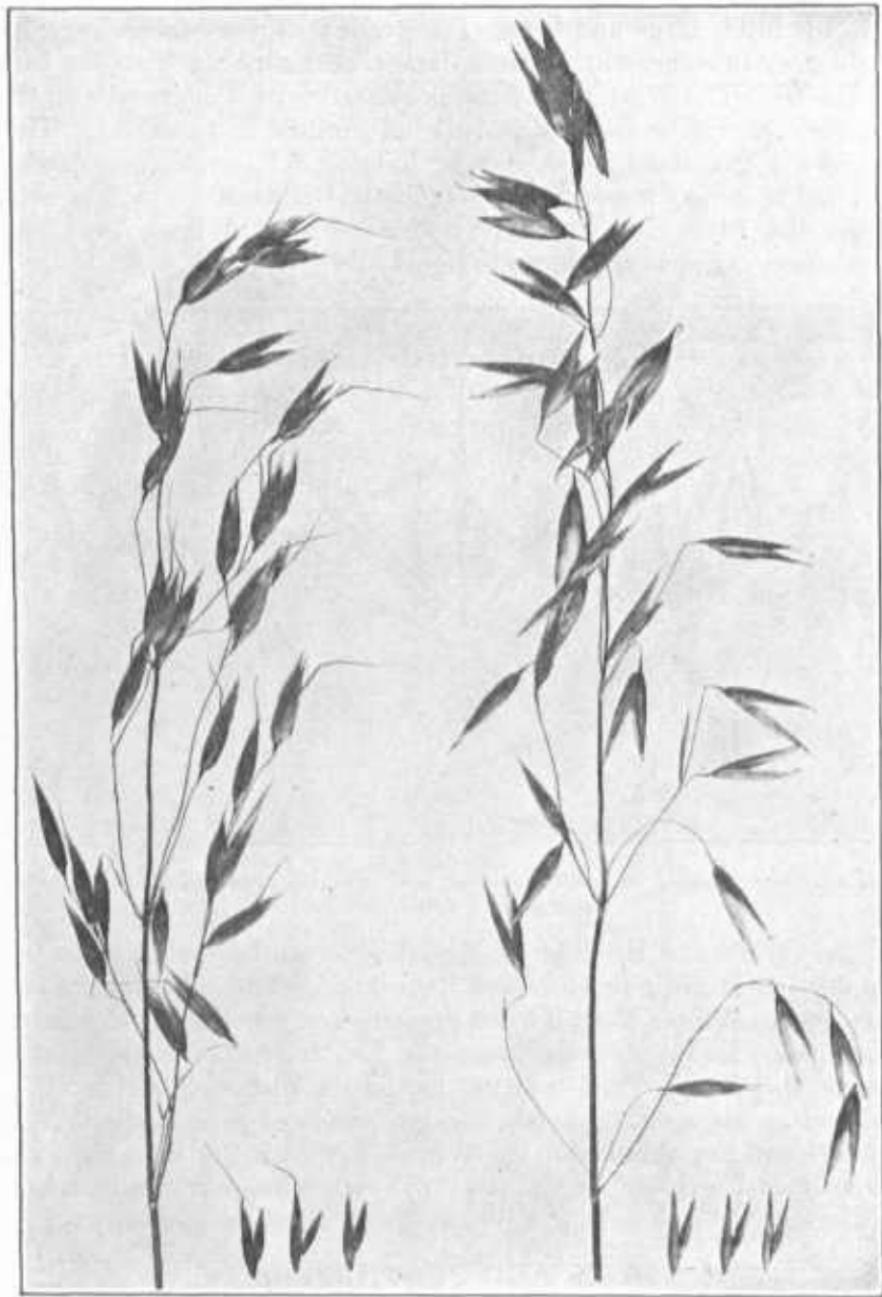


FIG. 5.—Heads of two less important varieties of winter oats: Left, Winter Turf; right, Culberson.

secured on the heavier loams. Heaving, or the "spewing out" of the plants, is most likely to occur on clay soils, particularly on those

deficient in humus. A well-fertilized sandy or sandy loam soil will generally prove more satisfactory, particularly if it is well filled with humus, so that its moisture-holding capacity is high. Good drainage is essential, however, as winterkilling is most likely to occur on poorly drained land. Rust and other diseases are also most severe on low, poorly drained areas. As the varieties of oats commonly grown in the South, with the exception of the Winter Turf, have stiff straw, they are less likely to lodge on rich soil than those grown in the North.

MANURES AND COMMERCIAL FERTILIZERS.

The kind and quality of fertilizers to use for oats, as for other crops, depend largely on the nature and fertility of the soil, and consequently local practice is generally the best guide. Barnyard manure is not usually available in sufficient quantities in the South to be much of a factor, and therefore dependence must be placed on green manures and commercial fertilizers. The crop most commonly used for green manuring in the South is cowpeas, though crimson clover, vetch, velvet beans, bur clover, peanuts, and red clover are among those available. Cowpeas, soy beans, and velvet beans are among the best available crops to immediately precede oats. These crops may be cut for hay, turning under only the stubble and roots, or the entire crop may be used as green manure. The fertilizing effect on the following crop is about the same whether the stubble or the entire plant is turned under, but the vines add considerable humus and improve the physical condition of the soil. If the vines are turned under, the land should be plowed three or four weeks before the oats are to be sown, as the ground should have time to settle before seeding. If the oats must be sown at once after the land is prepared, it is better to harvest the vines and disk the land thoroughly instead of plowing it.

If the soil has been liberally fertilized for other crops, phosphoric acid and potash need not be added for oats. Usually, however, increased yields result from light applications of acid phosphate and muriate of potash at the time of seeding. The proper quantity of acid phosphate to apply varies from 100 to 125 pounds to the acre on fertile clay soils to 200 to 250 pounds on the poorer sandy soils. The rate for muriate of potash varies from 30 pounds on the better clay soils to 60 pounds on poor sandy ones. The price of this fertilizer during the past three or four years, however, has been too high to justify its use. Nitrogen is usually the limiting element in the production of oats on southern soils.

If nitrogen has been supplied in liberal quantities through the growth of legumes as green manures, it need not be added in commercial fertilizers. If, however, a green-manure crop does not im-

mediately precede the oats, or if the preceding crop was light, some readily available fertilizer carrying nitrogen (ammonia) should be used. The best results on most classes of soil are to be obtained by adding this nitrogen as a top-dressing in the spring, about the time growth begins. On sandy soils, the application of about 25 pounds of nitrogen to the acre is recommended. This may be in the form of nitrate of soda, sulphate of ammonia, cottonseed meal, or dried blood. On clay soils this may be reduced to 18 or 20 pounds of nitrogen. If the oats are grown for hay, more nitrogen should be used than when they are grown for grain.

FALL OATS IN THE ROTATION.

Oats should follow a cultivated crop wherever possible. The most common cultivated crops in the South are cotton and corn, and, as corn is removed from the land earlier than cotton, oats usually follow the former. One of the best rotations which can be devised for the cotton-growing section is as follows: First year, cotton; second year, corn, with cowpeas planted at the last cultivation; third year, fall-sown oats, followed by cowpeas. The corn is cut for fodder, instead of being stripped and topped, as is commonly done in some sections; the corn stubble and cowpea vines are then turned under in time to sow oats in the fall. As the growth of pea vines is not heavy, the plowing can be done a short time before seeding. After the oat crop is removed the third year, the land is plowed and sown to cowpeas, which are cut for hay. If desired, crimson clover may be sown in the cotton the first year and plowed under in the spring before corn-planting time. Rye may also be sown the third year after the cowpeas and plowed under for cotton, thus providing a cover for the soil each winter. This rotation gives two grain crops, corn and oats; a money crop, cotton; a hay crop, cowpeas; and three green-manure crops, crimson clover, cowpeas planted in the corn, and rye, in three years. Two crops of cotton may be grown in this rotation, if desired, making a 4-year rotation.

Outside the cotton-growing section a good rotation, including oats, is as follows: First year, corn, with cowpeas in the corn; second year, oats, with clover or grass seeded in the oats; third year, meadow or pasture.

If it is desired to grow wheat, oats may be sown after the corn, and cowpeas may be sown after the oats are harvested. Wheat may then be sown after the cowpeas and grass seeded with it. Potatoes or other cultivated crops may be substituted for corn if desired. Where clover does not succeed, or where a permanent meadow is not wanted, the following rotation is a good one: First year, corn, with cowpeas in the corn; second year, wheat, followed by cowpeas to

be cut for hay; third year, oats, followed by cowpeas, sorghum, or some other forage crop. Rye may be sown after the forage crop is harvested, or the forage crop may be omitted and crimson clover sown early in the fall. The rye or crimson clover is then plowed under the following spring for corn. Other rotations along similar lines can be arranged, according to the crops it is desired to grow.

PREPARATION OF THE LAND.

The method of preparation of the land depends to some extent on the previous treatment it has received and on the character of the soil. In any case a seed bed with 2 or 3 inches of loose, mellow surface soil and a firm subsoil should be prepared, as the success of the crop depends in a large measure on the condition of the seed bed and on the fall growth.

If the land has been thoroughly plowed for the preceding crop, disk ing is usually preferable to plowing for fall-sown oats, particularly if the preceding crop was a cultivated one which has been kept free from weeds. Two diskings, lapping half, and a harrowing are usually sufficient, though more work may be necessary to make a good seed bed on hard, dry soils.

If, for any reason, it seems desirable to plow the land, it should be plowed 5 or 6 inches deep at least a month before the oats are to be sown and the plow followed immediately by a spike-tooth or other smoothing harrow. Double disk ing and another harrowing should then put it in shape for drilling. If it is loose from recent plowing, the roller or plank drag may be used to make a more compact seed bed. Rolling may often be done to advantage on loose, sandy land, but on the heavier loam and clay soils the roller should always be followed with the harrow, to break the crust and check evaporation. The fertilizer may be distributed when the seed is sown if the oats are to be drilled; otherwise it should be applied before the last harrowing.

PREPARATION OF THE SEED.

CLEANING AND GRADING.

The yield of oats can be considerably increased by cleaning and grading the seed and by treating it to prevent smut.

Seed oats should be thoroughly cleaned and graded before sowing. The stand produced from heavy seed is better and more uniform than that from ungraded seed. The strong, vigorous plants produced from plump, heavy seed stand the winter better than the weak ones which grow from light shriveled grains; their growth is better throughout the season and the yield larger. Cleaning the seed not only removes the weak, light grains of oats but takes out many weed

seeds. Most of the seeds of cheat, or chess, one of the most troublesome weeds in oat fields, can be removed by thorough cleaning.

Seed oats are usually cleaned and graded with the fanning mill, but where this machine is not available and the quantity of seed sown is small, fairly effective work can be done by pouring the grain back and forth from one vessel to another in a brisk wind. If a considerable quantity of seed is to be cleaned, the gain from sowing cleaned seed will soon repay the cost of a fanning mill.

TREATMENT OF SEED FOR SMUT.

A considerable portion of the oat crop is lost each year from the attacks of the smut fungus. This loss is easily and cheaply prevented by treating the seed before sowing with a solution of 1 pound of commercial formaldehyde (a solution of 37 to 40 per cent of pure formaldehyde) to 40 gallons of water.¹

The grain should be placed on a clean floor or canvas and sprinkled with the solution. The pile should be shoveled over continuously while applying the formaldehyde, to make sure that all the grain is thoroughly moistened. It should then be covered with blankets or canvas and left for several hours or over night, when it may be sown at once or spread out to dry. It will run through the drill much better if dried before sowing. Grain may also be treated by pouring it into a tub of the solution, stirring thoroughly, and spreading out to dry after it has remained in the solution 20 minutes to 2 hours. Sprinkling is just as effective, however, and is a cheaper and more rapid method. Care should be used not to put the treated grain into bins, sacks, or machinery where it is likely to come in contact with smut spores.

SOWING THE SEED.

The success of the fall oat crop depends in a large measure on the time, the rate, and the manner of seeding. Early seeding with the grain drill or in open furrows, using 2 to 3 bushels of seed to the acre, is recommended.

TIME OF SEEDING.

Fall-sown oats are less hardy than wheat or barley and for that reason should be sown earlier, so that the plants may become well rooted and make considerable top growth before cold weather. Oats are seldom attacked by insects in the fall, so that there is no necessity for delay in seeding, as with wheat where the Hessian fly is common. In the extreme South, seeding need not be done until November, but farther north September and October are the best months.

¹ Farmers' Bulletin 939, entitled "Cereal Smuts and the Disinfection of Seed Grain," gives complete directions for the use of the formaldehyde treatment.

In Oklahoma, northern Arkansas, Kentucky, Tennessee, Maryland, and the higher portions of Virginia and North Carolina seeding should usually be completed by September 20. In the lower portions of Tennessee, Virginia, and North Carolina, the mountain sections of South Carolina, Georgia, and Alabama, southern Arkansas, and in northern Mississippi and Texas, the seed should ordinarily be sown between September 20 and October 10. In northern Louisiana, central Texas, Mississippi, Alabama, and Georgia, and the lower portion of South Carolina seeding may be done almost any time during the month of October, while along the Gulf coast late October and early November seeding is usually satisfactory.

METHOD OF SEEDING.

The methods of seeding oats are (1) broadcast seeding; (2) drilling with the ordinary grain drill; and (3) drilling with a specially devised drill by what is known as the open-furrow method.

Oats are sometimes sown broadcast, but this method is not to be recommended. When sown broadcast and harrowed in, much of the seed is left near the surface, even in well-prepared ground, so that many of the plants are shallow rooted and are killed by heaving or cold. A better method, where broadcast seeding is necessary, is to sow the seed on clean ground which has been disked, covering it about 3 inches deep with the turning plow. The ground should then be left rather rough, as the uneven surface furnishes some protection for the plants. More seed should be used in broadcast seeding than in drilling.

The use of the grain drill in sowing oats is strongly recommended. Drilling produces a more uniform stand and more even germination and growth than broadcast seeding. Drilling also requires less seed and the plants are less likely to winterkill. Drilling at least 3 inches deep on well-prepared land, leaving the drill furrows as open as possible, is advised. Drag chains should not be used on the drill, nor should the land be harrowed after drilling. This leaves the seed in the bottom of shallow furrows, which in a measure protects the young plants from winterkilling. Figure 6 shows a disk drill as it should be used in sowing oats in the fall.

As the kernels of varieties of the Red Rustproof type are likely to stick together, the drill should be watched closely to see that the seed is being evenly distributed. A drill with a good force feed will sow this variety quite satisfactorily.

The Georgia experiment station a number of years ago devised what is known as the open-furrow method of seeding oats. By this method the seed is sown in drills from 16 to 24 inches apart, the ordinary single-row planter or a specially devised drill being used for the purpose. If desired, a drill with a fertilizer attachment may be

used and the fertilizer distributed in the furrows with the seed. A combined grain and fertilizer drill, for sowing four rows 16 inches apart by the open-furrow method, is shown in figure 7. The seed is sown in drills or furrows several inches deep, so that the roots and crowns of the plants are 2 or 3 inches below the surface. The rains and alternate freezing and thawing partially fill these furrows, but the plants are still left well below the surface. While this method has been strongly recommended by some writers, experiments indicate that ordinarily no increase in yield is obtained from its use.

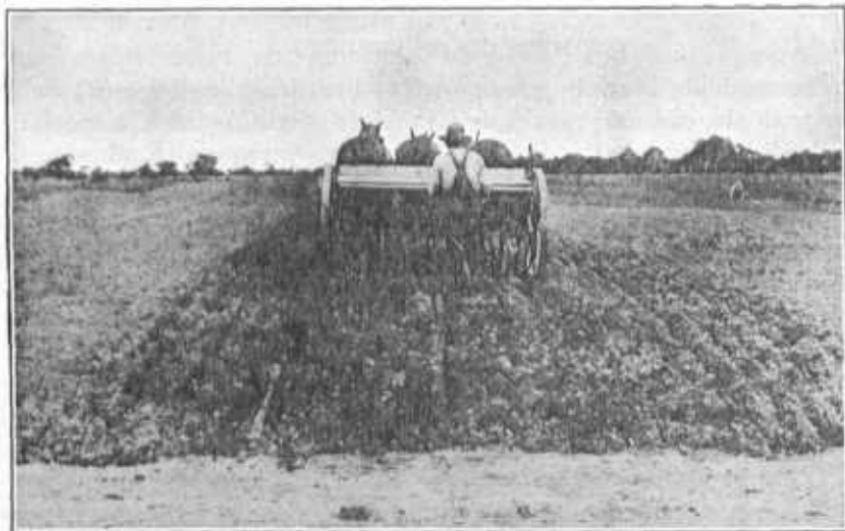


FIG. 6.—A disk drill with drag chains removed, as it should be used in sowing oats in the fall.

RATE OF SEEDING.

The rate of seeding usually recommended for Red Rustproof and similar varieties of oats when sown with the open-furrow drill is 2 bushels to the acre. When sown with the ordinary drill $2\frac{1}{2}$ bushels is about the proper rate. Broadcast seeding requires still more seed, from 3 to 4 bushels being necessary. As the Winter Turf oat is somewhat hardier and stools more than the Red Rustproof, it may be seeded at a lower rate, from $1\frac{1}{2}$ to 2 bushels when drilled or $2\frac{1}{2}$ bushels when sown broadcast. In the northern portion of the fall-oat area, where the danger from winterkilling is great, and farther south when late seeding is necessary, the rate of seeding should be somewhat increased.

From $2\frac{1}{2}$ to 3 bushels of the Red Rustproof or Culberson and 2 to $2\frac{1}{2}$ bushels of the Winter Turf are about the proper rates of seeding for the colder portions of the fall-oat belt. When the crop is to

be used for pasture or hay somewhat heavier seedling is advisable than where it is grown for grain. When used as a nurse crop for grasses or clover or when grown with crimson clover or vetch, less seed should be used than when oats are grown alone.

TREATMENT OF THE LAND AFTER SEEDING.

Top-dressing with barnyard manure in the fall and the application of nitrate of soda in the spring have already been mentioned as means of increasing the yield of fall-sown oats. Injury to the plants from heaving during the winter and early spring, with the consequent exposure of the roots to the sun and wind, may sometimes be prevented by rolling the land as soon as possible after the heaving

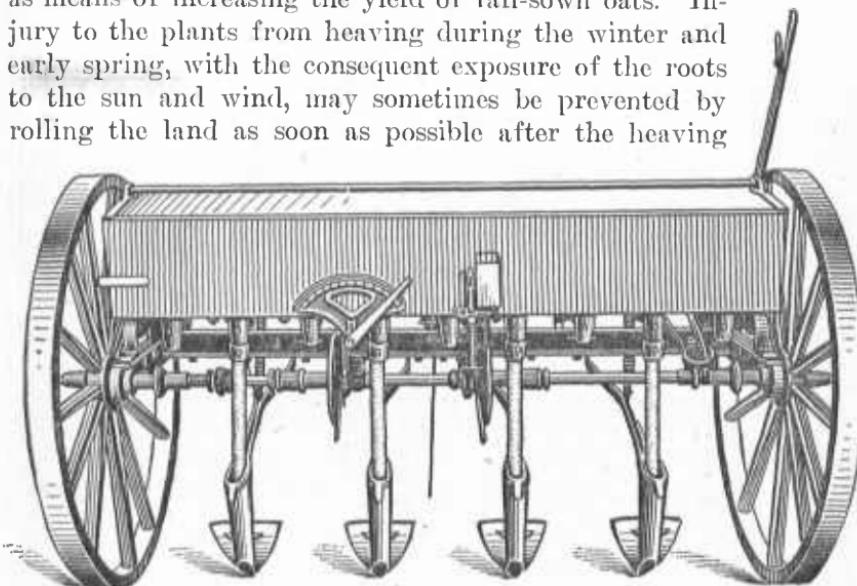


FIG. 7.—Open-furrow drill for sowing oats in the fall.

takes place. Clay soils, the type on which heaving is most likely to occur, should not be rolled when wet, so that this method of reducing the damage can not always be used. When the open-furrow method of seeding is used the ridges between the rows should be leveled down in the spring with a harrow.

Oats, like other fall-sown grains, are sometimes used as pasture for stock. Early seeding is particularly essential when the crop is to be pastured in the fall. Pasturing at this time always increases the danger from winterkilling, as it lessens the protection afforded by the leaves. Fall-sown oats should not be pastured as closely as wheat or rye, as the oats are less hardy than the other grains. Pasturing in the spring delays maturity. As earliness is essential to the production of a good crop of oats the value of the pasture does not usually make up for the loss in yield of grain. Grain fields should never be pastured when the ground is wet, as the trampling injures the physical condition of the soil and many of the grain plants may be pulled out.

WEEDS.

One of the most common weeds in fall-sown oat fields is cheat, or chess. The popular belief that oats turn to cheat is due to the rapid, vigorous growth of this weed and the manner in which it occupies the ground where grain has winterkilled. Occasional plants of cheat, which would hardly be noticed in a good stand of oats, grow so vigorously and stool so abundantly when given plenty of space by the winterkilling of the oats as to give the impression that the entire crop has turned to cheat. When a considerable proportion of the crop is cheat, the best plan is to cut the oats and cheat together for



FIG. 8.—Harvesting fall-sown oats in Madison County, Miss.

hay before the seeds mature. If the oats are entirely killed the cheat should be plowed under and the land used for a cultivated crop. Other winter weeds, such as chickweed, shepherd's-purse, and peppergrass, sometimes cause trouble, but these are not often serious pests and can usually be kept in check by harrowing. Weeds which do not start growth until spring do not often cause trouble, as the growth of the crop is rapid at that season. Rotation of crops, good cultivation, and thorough cleaning of seed grain are strongly recommended as means of keeping weeds under control.

HARVESTING THE CROP.

Oats are usually cut with a grain binder, but where the area is too small to justify the use of this machine, a mower or even a cradle

may be used. If cut with the binder the grain should be allowed to stand until nearly ripe or until just after it passes out of the hard dough stage. Binders at work in a field of fall-sown oats are shown in figure 8. The bundles or sheaves should be set up in round shocks of 10 or 12 bundles each, using 1 or 2 bundles for caps or covering with canvas shock covers. The bundles should be thoroughly dry when shocked and the shocks should be carefully built, so that the grain is exposed as little as possible to the weather. A field of fall-sown oats in shock in Mississippi is shown in figure 9. If it is necessary to cut the oats with a mower, they should not be as ripe as for



FIG. 9.—Field of Red Rustproof oats in shock, Madison County, Miss. Well built shocks help to protect the grain from injury by weather.

binding, or there will be loss from shattering in handling. The oats usually grown in the South do not shatter readily, however. When cut with the mower the grain should be allowed to cure for a short time in the swath or windrow and should then be placed in well-built cocks and, if possible, covered with canvas covers.

When the grain has cured in the shock, which will be in about ten days if the weather is good, it should be stacked or placed under cover. If a thrashing machine is available, it may be thrashed at once. In any case, it should be dry when stacked or stored, as it is likely to mold if at all damp. Grain which has been cut with the mower may be stacked as soon as cured and may then be handled in the same manner as that which is bound. In either case, it may, with little loss, be fed to stock without thrashing, or it may be

thrashed when thoroughly dry. If it is thrashed, the grower should see that all the grain is removed from the straw and that the separation of grain and chaff is complete. After thrashing, the grain should be stored in tight bins, where it is protected from the weather and from vermin. The straw should be run into the barn or carefully stacked, so that the loss from weathering will be slight.

If the crop is to be used for hay, it should be cut after the grain is developed but before the straw becomes tough and hard. If it is grown with vetch, crimson clover, or some other crop, the time at which it is ent will depend to some extent on the state of maturity of the crop with which it is grown. The hay should be cured in the windrow and cock, with as little exposure to rain as possible, and should be placed under cover or stacked as soon as it is cured. The curing of hay is sometimes difficult in the South, owing to frequent rains, and the best quality can be secured only by protecting the cocks from the weather by the use of canvas covers. If these are carefully stored when not in use, they will last for a number of years and will prove a good investment. Oats may be cut for soiling (feeding green) as soon as the heads begin to show, and cutting may continue until the crop is nearly ripe. If ent in the early stages, the stubble will produce a fairly heavy second crop.

USES OF THE OAT CROP IN THE SOUTH.

The high value of oats for feeding to horses and mules is generally well understood. The market price of oats in the South is usually so high that this grain can not be fed with profit to any other class of animals. Even when fed to horses and mules the most economical results can be obtained by substituting corn for a part of the ration. Oats are particularly valuable for feeding to colts and to other young and growing stock. The value of this grain for feeding to young animals is due to its high proportion of ash, or bone-forming material, and of protein, or muscle-forming material.

A very common practice in the South is to feed oats in the bundle to work stock. The Red Rustproof and other southern varieties are unlike northern spring oats in that the leaves and stems are still quite green when the grain is nearly ripe; hence the straw is much better feed. Feeding oats in the bundle provides both grain and hay for the animals and saves the expense of thrashing and of providing tight bins for storing the grain. Bundle oats make an excellent summer feed for horses and mules.

When oats are not too high in price they are a valuable grain for feeding to dairy cows, sheep, and poultry. As they are not fat-producing, they are not of value in fattening cattle, while their high proportion of crude fiber makes oats an inferior feed for hogs. Oats

are usually fed whole to all kinds of stock, though for young animals or for older ones with poor teeth the grain should be crushed.

Oat straw, as previously stated, is a better feed than the straw of any other small grain. It is a valuable roughage for feeding to all kinds of stock not at hard work, but contains too much waste material to make up the entire ration. When fed with cowpea or other hay which is high in feeding value it gives bulk to the ration and lessens its cost.

Oats make excellent hay, which matures early enough in the season to allow the production of another crop on the land. The yield is heavy, from 1 to 3 tons to the acre, according to the fertility of the soil, and the quality is high. The hay is easily cured and is relished by all kinds of stock. The yield and feeding value may both be increased by growing vetch or some other leguminous crop with the oats.

Good pasture for stock of all kinds is produced by fall-sown oats. As previously stated, however, pasturing the crop usually reduces the yield of grain. When the pasture provided by a fall-grain crop is an important item it is usually better to use wheat or rye, as either of these crops may be pastured quite closely and yet produce a satisfactory crop of grain. If desired, oats may be pastured closely in the spring, then plowed under and the land planted at once to some other crop. Vetch and oats together make good pasture, particularly for sheep and hogs.

As a soiling crop oats can not be used as early in the spring as rye, but the feed produced is of better quality and can be used for a longer period. The quantity of green feed produced by oats is large, and the crop can be used over a considerable period. If cut early, a good second crop is produced. Cutting can be begun as soon as the plants begin to show heads and may be continued until the grain is nearly ripe. Green oats are relished by all kinds of stock, and there is little waste in feeding. Vetch or crimson clover, grown with the oats, improves the quality of the green feed produced.

Oats are also used as a nurse crop and as a cover crop. The use of oats as a nurse crop is rather rare in the South, as grass or leguminous crops are not often sown for the production of permanent meadows. In general, these crops succeed better in the South when seeded without a nurse crop. Where a nurse crop is used, wheat and barley are to be preferred to oats, as they make less shade. As a winter cover crop, to prevent washing of the soil, the value of oats has already been stated.

